Creation of Learner Personas for a Biomedical Data Science Curriculum

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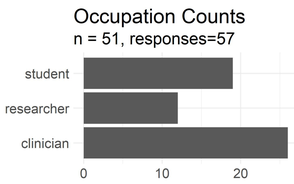
INTRODUCTION

- Learner's prior knowledge and organizational structure in their **mental model** will affect the way they learn
- We created a **self-assessment survey** to create **learner personas** to discern both current knowledge and knowledge gaps/needs
- **Learner personas** are fictional characters that represent key characteristics of a particular learner: **background**, **prior knowledge or experience**, **perception of needs**, and **special considerations**
- The accelerating **changes in medical education** incorporating data science competencies indicate the growing need of data science education in the biomedical sciences
- A **backward design approach** using learner personas for creating lessons kept content creation and teaching focused and maintain alignment with the overall **learning objectives**

Methods

- 31-question learner **self-assessment survey**
  - Questions on: prior programming, statistics, and data knowledge
- **Hierarchical clustering** using scaled euclidean distance and Ward's clustering criterion to cluster observations
- **Elbow method**, **gap statistic**, **and interpretability** were used to pick the number of clusters (i.e., personas)
- **PCA** (principal component analysis) and **EFA** (exploratory factor analysis) using promax rotation used to validate the survey and simplify the original survey

Demographics and Clusters



- 57 respondents, 51 consented
- 45 responses were used for the clustering due to missing responses

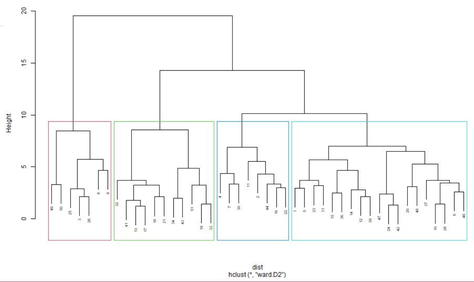
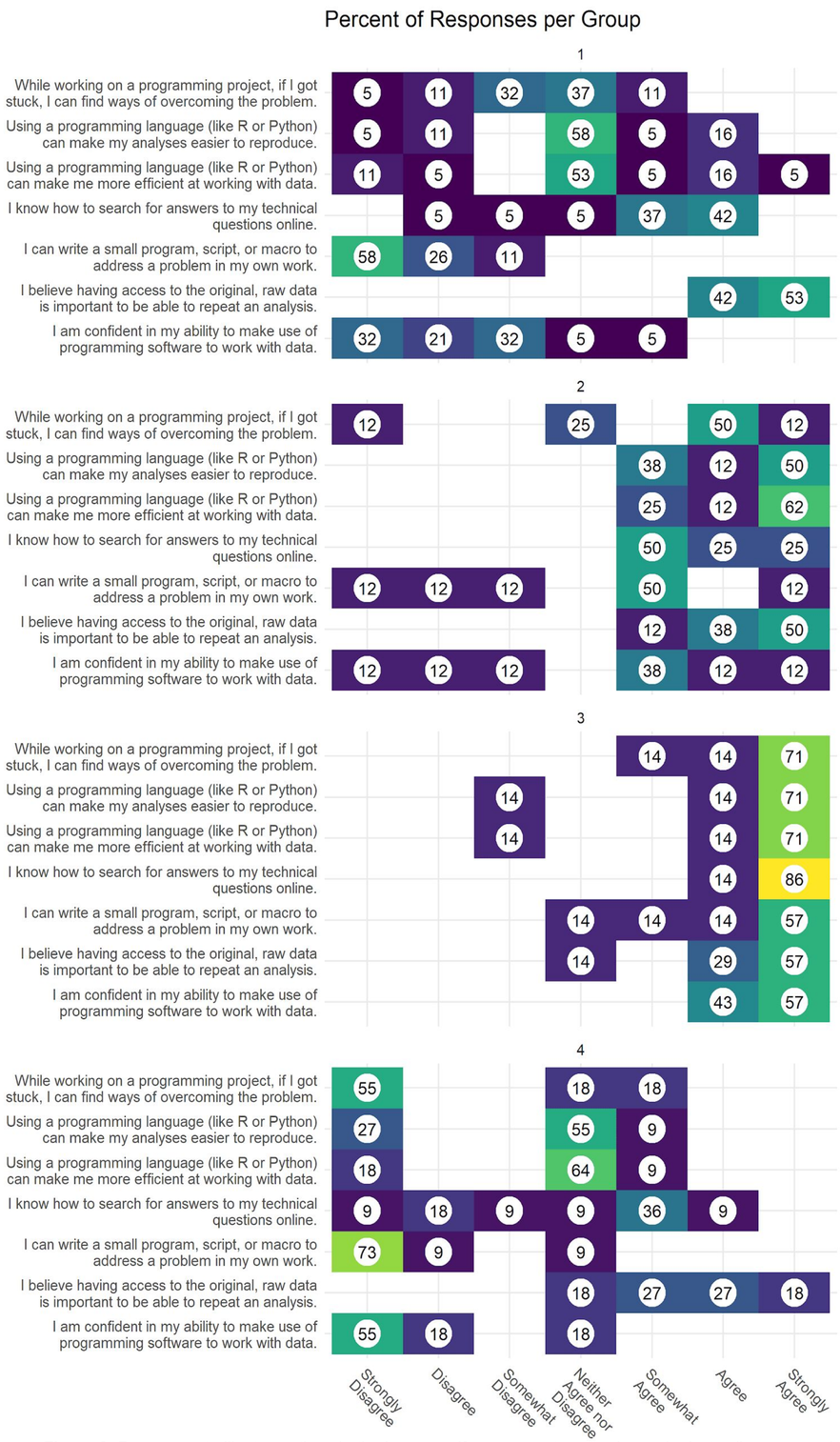
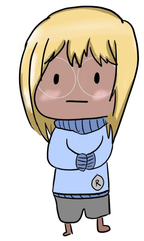


Figure 1. Survey demographic information and clustering. **Top** - Counts of each occupation group. Respondents were able to select more than one occupation. Groups shown were aggregated from original choices **Right** - Dendrogram clusters. Left to right: programmers, clinicians, students, academics

Personas





Alex
Academic

Samir
Student

Patricia
Programmer

Clare
Clinician

Figure 2. Responses to likert questions in the learner self-assessment survey by each cluster (i.e., persona). Colors and values show the percent of respondents in each cluster and their agreement with each statement.

Results

- **Simplified survey** down to 3 questions using the highest EFA factor loading for 3 factors, one for each question domain:
  - **Data**: Do you know what "long" and "wide" data are?
  - **Programming**: How familiar are you with interactive programming languages like Python or R?
  - **Statistics**: If you were given a dataset containing an individual's smoking status (binary variable) and whether or not they have hypertension (binary variable), would you know how to conduct a statistical analysis to see if smoking has an increased relative risk or odds of hypertension? Any type of model will suffice.
- These **personas** were used to create **lesson materials** to teach data science skills to people who work in the medical and biomedical sciences: https://ds4biomed.tech/

Conclusion

- Creation of **learner personas** that resonated with workshop attendees
- **Structured learning material** creation based on learner personas will aid in information content and knowledge retention
- The **learner self-assessment survey** and **clustering methodology** can be adapted to other disciplines

References

Ambrose, Susan A, Michael W Bridges, Michele DiPietro, Marsha C Lovett, and Marie K Norman. *How Learning Works: Seven Research-Based Principles for Smart Teaching*. John Wiley & Sons, 2010.

Jordan, Kari, François Michonneau, and Belinda Weaver. "Analysis of Software and Data Carpentry's Pre- and Post-Workshop Surveys." Zenodo, July 17, 2018. https://doi.org/10.5281/zenodo.1325464.

RStudio, Education Team. "RStudio Learner Personas," 2019. https://rstudio-education.github.io/learner-personas/.

Wilson, Greg. *Teaching Tech Together: How to Make Your Lessons Work and Build a Teaching Community around Them*. CRC Press, 2019.

Zagallo, Patricia, Jill McCourt, Robert Idsardi, Michelle K Smith, Mark Urban-Lurain, Tessa C Andrews, Kevin Haudek, et al. "Through the Eyes of Faculty: Using Personas as a Tool for Learner-Centered Professional Development." *CBE—Life Sciences Education* 18, no. 4 (2019): ar62.

Poster: https://github.com/chendaniely/dissertation-presentations
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